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I, JANENE PEISKER, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004900194 for a patent by MR ANTHONY RENFREW WHITE as filed on 16 January 2004.

WITNESS my hand this
Eighteenth day of February 2005

JANENE PEISKER
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA
Patents Act 1990

PROVISIONAL SPECIFICATION

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Invention Title: A Hand Truck

This invention is described in the following statement:

The present invention relates generally to hand trucks and, in particular, to electrically powered hand trucks that are adapted to both raise and lower a load.

Hand trucks are often used in material handling applications to transport loads relatively short distances. A typical hand truck includes an upstanding elongate frame having a pair of handles at an upper end thereof and a foot portion in the form of a plate extending perpendicularly from a lower end of the frame. Two rotatable wheels are mounted on the frame adjacent to the foot portion so that a user can wheel the truck around while a load is supported on the truck by the frame such that the load rests on the foot portion of the frame.

Electrically powered hand trucks have been developed which are able to lower or raise a load. Some examples of hand trucks of this type are disclosed by United States Patents 3,907,138, 4,034,878, and 6,398,477. The hand trucks disclosed by these patents have telescoping main and sub-frames. The main frame has a pair of rotatable wheels mounted adjacent a lower end thereof and a handle located adjacent its upper end. The sub-frame, which has a foot portion extending perpendicularly from a lower end thereof, is able to be extended and retracted relative to the lower end of the main frame such that the foot portion, which normally is positioned generally level with the wheels, can be lowered to a position below the wheels and then returned to its normal position. This is accomplished by suitably rotating a screw shaft which is mounted on the main frame and which engages a bearing nut fixed to the movable sub-frame. The screw shaft is rotated by an electric motor which is powered by a battery power source. Both the electric motor and the battery power source are carried by the hand truck. Electrical switching means is provided to allow a user to select the direction of rotation of the screw shaft for extending or retracting the sub-frame.

The hand trucks of the '138 and '878 patents are unable to lift a load in a similar manner to a forklift which is able to elevate a load above a surface while the forklift rests on the surface.

In contrast to the hand trucks of the '138 and '878 patents the hand truck disclosed by the '477 patent is able to lift a load in a similar manner to a forklift. This is achieved by providing the hand truck with a pair of load arms which are pivotally joined to the lower end of the truck's main frame. The load arms may be stowed by

pivoting them relative to the main frame so that they are generally parallel with the sides of the main frame. Alternatively, the load arms may be pivoted relative to the main frame so that they extend perpendicularly from the lower end of the main frame and are adjacent to and generally level with the hand truck's foot portion. To elevate a load above the surface on which the truck rests, the hand truck is arranged in an upright position so that the foot portion is adjacent the surface. The load arms are then pivoted relative to the main frame so that they extend perpendicularly therefrom and are adjacent to the foot portion. After the load has been placed on the load arms the electrical switching means is operated so that the sub-frame is extended from the lower end of the main frame. Movement of the sub-frame relative to the surface ceases once the sub-frame contacts the surface, thereafter further extension of the sub-frame from the main frame results in the main frame being elevated above the surface. Since the load arms are attached to the main frame and the load is supported by the load arms, the elevation of the main frame results in the load arms and the load being elevated as well.

Although the hand truck disclosed by the '477 patent is able to elevate a load, the need to ensure that the load arms are properly positioned before either lowering or raising the load adds an extra level of complexity to the operation of the hand truck.

United States Patent 4,049,083 discloses a hand truck which addresses the aforementioned deficiency of the hand truck disclosed by the '477 patent. In particular, the '083 patent discloses a stacker that is able to be attached to the hand truck disclosed by the '138 patent which was discussed previously. The stacker has a long stationary frame and a short inner frame that is able to move along the stationary frame. A pair of lifting legs extends perpendicularly from a lower end of the inner frame such that the lifting legs are able to support a load in a similar manner to the foot portion of the hand truck. The stacker also has an elongate screw shaft which freely rotates in a journal at the top of the stationary frame, but which is operatively joined to a bearing nut fixed to a top wall of the inner movable frame. The screw shaft is operatively engaged to an electric motor of the stacker which can be powered by the battery carried by the hand truck. The inner frame is moved along the

stationary frame to either lower or raise the lifting legs by operating the electric motor to rotate the screw shaft in the appropriate direction.

The stacker attachment disclosed by the '083 patent is able to extend the versatility of an electrically powered, hand truck such as the one disclosed by the '138 patent so that the hand truck is able to both lift and lower a load relative to a normal position of the hand truck's foot portion with respect to the hand truck's main frame. Also, the stacker attachment overcomes the previously mentioned deficiency of the hand truck disclosed by the '477 patent by doing away with the load arms which add to the complexity of operating that particular hand truck. However, since the stacker is an attachment and is not an integral part of the electrically powered hand truck to which it may be attached, the stacker and the hand truck, whilst being attached to each other, must nevertheless be operated as separate machines as no integrated control system is provided for operating both the hand truck and the stacker. Moreover, attaching the stacker to the hand truck would likely add considerably to the weight of the hand truck in which case the manoeuvrability of the hand truck would be impaired.

It is an object of the present invention to provide a hand truck which overcomes, or at least ameliorates, one or more of the deficiencies of the prior art mentioned above, or to provide the consumer with a useful or commercial choice.

Other objects and advantages of the present invention will become apparent from the following description, taken in connection with the accompanying drawings, wherein, by way of illustration and example, a preferred embodiment of the present invention is disclosed.

According to the present invention there is provided a hand truck for transporting a load, the hand truck including a sub-frame with a foot portion extending generally perpendicularly from a lower end thereof so that the sub-frame is able to support the load, a main frame engaged with the sub-frame such that the sub-frame is able to be extended and retracted with respect to a lower end of the main frame, at least one wheel secured to the main frame so that the truck is able to be wheeled about, a selectively operable electric motor connectable to an electrical power supply, a controller coupled to the motor for enabling a user to control the operation of the

motor, and a flexible linkage coupling the motor, main frame and sub-frame together such that the motor is operable to move the linkage and thereby extend or retract the sub-frame, whereby the foot portion is able to be raised or lowered with respect to a normal position thereof relative to the main frame so that the load is raised or lowered with respect to the normal position.

The term "frame" as used in this specification is defined as including within its scope a frame which consists of one or more individual frame members.

The flexible linkage may be in the form of a roller chain, a cable, or a belt.

According to a preferred embodiment of the invention the sub-frame includes an extension that is able to be selectively extended relative to the lower end of the sub-frame to thereby increase the length of the sub-frame.

A spring may be secured to the sub-frame and the flexible linkage to take up slack in the flexible linkage.

In order that the invention may be more fully understood and put into practice, an embodiment thereof will now be described with reference to the accompanying drawings, in which:

Figure 1 is a front view of a lower portion of a hand truck according to an embodiment of the present invention;

Figure 2 is a front view of an upper portion of the hand truck illustrated in figure 1;

Figure 3 is a front view of an upper portion of the hand truck illustrated in figure 1 which provides further details thereof;

Figure 4 is a front view of a lower portion of the hand truck illustrated in figure 1 which provides further details thereof;

Figure 5 is a rear view of the hand truck illustrated in figure 1;

Figure 6 is a rear view of an upper portion of the hand truck illustrated in figure 1;

Figure 7 is a front view of the hand truck illustrated in figure 1 with its sub-frame extension fully extended;

Figure 8 is a front view of a lower portion of the hand truck illustrated in figure 1 with the foot portion thereof in its normal position relative to the main frame

of the truck;

Figures 9 – 11 illustrate the method for moving a load up and down a staircase with the hand truck illustrated in figure 1; and

Figure 12 is a side view of the hand truck illustrated in figure 1 which shows the sub-frame retracted relative to the main frame such that the foot portion of the sub-frame is elevated with respect to its normal position relative to the main frame.

Referring to figures 1 to 8, a hand truck 20 according to an embodiment of the present invention includes a telescoping frame comprising a main frame 21 and a sub-frame 22 which is slideably received by the main frame 21.

The main frame 21 includes a pair of laterally separated and parallel side rails 23 and 24 which define opposing side channels 25, 26. Handles 27 and 28 are respectively attached to side rails 23 and 24. Laterally separated and parallel cross members 29 and 30 extend between the side rails 23, 24 and the handles 27, 28, respectively. A cross member 31 extends between the side rails 23, 24 and is located adjacent a lower end 32 of the main frame 21.

The sub-frame 22 includes a pair of laterally separated and parallel side rails 40, 41 which are provided by tubes of rectangular transverse cross-section and are slightly shorter than the side rails 23, 24 of the main frame 21. Cross members 42 to 46 extend between the side rails 40, 41 and a foot portion 47 extends perpendicularly from a lower end 48 of the sub-frame 22. Gaps 49 and 50 are provided between the foot portion 47 and the side rails 40, 41 so that the foot portion 47 does not impede movement of the sub-frame 22 relative to the main frame 21. Strap bars 51 and 52 are respectively secured to cross members 44 and 45 such that the strap bars 51, 52 extend across the side rails 40, 41. The strap bars 51, 52 are laterally spaced from the cross members 44, 45 to ensure that the strap bars 51, 52 do not impede movement of the sub-frame 22 relative to the main frame 21.

An extension 55 is received by the sub-frame 22 at the lower end 48 thereof. The extension 55 includes side rails 56, 57 and a cross member 58 extending therebetween and located at a lower end of the extension 55. The side rails 56, 57 are provided by tubes which have a rectangular transverse cross-section which is slightly

smaller than the cross-section of the sub-frame's side rails 40, 41 so that the side rails 56, 57 are able to slide within the side rails 40, 41. The side rails 56, 57 may be retracted inside the side rails 40, 41 to thereby retract the extension 55. Alternatively, the side rails 56, 57 may be extended from the side rails 40, 41 to thereby extend the extension 55. Pins 59 secure the extension 55 in position relative to the sub-frame 22 by being inserted into aligned apertures in the side rails 40, 41, 56, 57.

The sub-frame 22 engages with the main frame 21 such that the side rails 40 and 41 of the sub-frame 22 are respectively slideably received by the side channels 25 and 26 of the main frame 21. The provision of bearings, such as that indicated at 53 in Figure 3, reduces friction between the side rails 40, 41 and the side channels 25, 26 and ensures the smooth movement of the sub-frame 22 relative to the main frame 21 so that the sub-frame 22 is able to be extended and retracted with respect to a lower end 54 of the main frame 21.

Brackets 60 and 61 are attached to side rails 23 and 24, respectively, and are located adjacent the lower end 54 of the main frame 21. Wheels 62 and 63 are secured to opposite ends of an axle which is journaled to the brackets 60, 61 so that the wheels are able to rotate. The wheels 62, 63 are located on opposite sides of the main frame 21 and are adjacent to the lower end 54 thereof so that the hand truck 20 may be wheeled about in the usual manner.

An electric motor 70, gearbox 71, and battery 72 are secured to the main frame 21 and are located adjacent the lower end 54 of the main frame 21 and between the wheels 62, 63. An output shaft of the motor 70 drives an input shaft of the gearbox 71 which in turn drives an output shaft of the gearbox 71 which is at a right angle to the input shafts. The output shaft of the gearbox 71 has a drive sprocket 73 fitted to an end thereof so that rotation of the output shaft causes the sprocket 73 to rotate.

The battery 72 is connected to the motor 70 and serves as the electrical power supply for the motor 70. A user is able to control the operation of the motor 70 by means of a switch 74 which is mounted on the main frame 21 and coupled to the motor 70. In particular, by using the switch 74, a user is able to control the direction of rotation of the motor's output shaft and, hence, the direction of rotation of the drive

sprocket 73. Moreover, a user is able to stop the motor 70 via the switch 74 so that rotation of the drive sprocket 73 ceases.

A rotatable guide sprocket 75 which is aligned with the drive sprocket 73 is secured to the main frame 21 by means of a support 76 which is bolted to the cross members 29, 30.

One end of a flexible linkage in the form of an industrial roller chain 77 is attached to the cross member 45 of the sub-frame 22 and the chain 77 is then trained around the guide sprocket 75 followed by the drive sprocket 73. The free end of the chain 77 is then attached to the cross member 42 of the sub-frame 22. A coil spring 78 is attached to the cross member 42 of the sub-frame 22 and the chain 77 to take up slack in the chain 77. By coupling the motor 70, main frame 21 and sub-frame 22 together with the chain 77 in this way, rotation of the drive sprocket 73 by the motor 70 causes the chain 77 to extend or retract the sub-frame 22 relative to the lower end 54 of the main frame 21 depending upon the direction in which the drive sprocket 73 is rotated by the motor 70. Cutout switches located at the lower end 54 of the main frame 21 and at the top of the side rails 23, 24 are connected to the motor 70 and operate to automatically stop the motor 70 from operating should there be a danger of the sub-frame 22 being excessively extended or retracted.

A user is able to control the motor 70 so that the sub-frame 22 is retracted to such an extent that the position of the foot portion 47 relative to the main frame 21 is generally level with the wheels 62, 63 (see Figure 8). This is the normal position of the foot portion 47 relative to the main frame 21 and is usually where the foot portion 47 is positioned when the hand truck 20 is being wheeled about.

The hand truck 20 is particularly useful for carrying loads up and down a staircase without requiring much physical exertion on the part of the user. Figures 9 to 11 illustrate how the truck 20 may be used to carry a load up a staircase 90. The loaded truck 20 is initially positioned at the foot of the staircase 90 so that the wheels 62, 63 can clear the front edges of the stair treads and the foot portion 47 extends away from the staircase 90. The user then operates the switch 74 so that the sub-frame 22 is extended from the main frame 21. Once the sub-frame 22 has been extended to a sufficient extent so that the foot portion 47 contacts the ground, further

extension of the sub-frame 22 results in the main frame 21 being elevated with respect to the sub-frame 22. The main frame 21 is elevated until the truck 20 can be tilted backward so that the wheels 62, 63 are able to rest on a stair tread of the user's choosing which is elevated above the foot of the staircase 90. This is illustrated in figure 9 which shows the wheels 62, 63 resting on a tread and against a riser which are located above the foot of the staircase 90. After tilting the truck 20 further backward so that the foot portion 47 is lifted off the ground, the user operates the switch 74 to retract the sub-frame 22 as shown in figure 10. As illustrated in figure 11, sub-frame 22 is retracted to a sufficient extent so that the foot portion 47 can be rested on the tread of the step which is immediately below the step upon which the wheels 62, 63 rest. The truck 20 is then tilted forward slightly and the switch 74 is operated to again extend the sub-frame 22 from the main frame 21 so that the wheels 62, 63 are raised to the level of another stair tread, whereupon the truck 20 is tilted backwards so that the wheels 62, 63 engage with a higher stair tread and riser. The truck 20 is then tilted back as before and the sub-frame 22 is retracted until the foot portion 47 can be rested on the tread of the step which is immediately below the stair upon which the wheels 62, 63 rest. The procedure is repeated until the truck 20 reaches the top of the staircase 90 and the sub-frame 22 has been retracted so that the foot portion 47 is at its normal position. The reverse of the procedure is used to carry a load down the staircase 90. For very heavy loads the extension 55 may be lowered to assist the user in tilting the truck 20 backwards.

The hand truck 20 can also be operated to lower itself and a load from an elevated platform such as the deck of a commercial vehicle. This is done by positioning the loaded truck 20 so that the foot portion 47 of the truck 20 is positioned past the edge of the deck and the wheels 62, 63 which rest on the deck are adjacent the deck edge. The switch 74 is then operated so that the sub-frame 22 is extended from the lower end 54 of the main frame 21 until the foot portion 47 contacts the surface below the deck onto which the load is being lowered. The truck 20 is then tilted forward by a sufficient amount so that the main frame 21 will clear the deck while being lowered to the surface below. Lowering of the main frame 21 is accomplished by operating the switch 74 to retract the sub-frame 22. Once wheels 62 and 63 contact

the surface below so that the foot portion 47 is again at its normal position relative to the main frame 21, the truck 20 can be tilted backwards and wheeled away. The reverse of the procedure for lowering a load from an elevated platform is used to lift both the truck 20 and its load onto such a platform from a position below the platform. If the elevated platform is so high above the lower surface that fully extending the sub-frame 22 is not sufficient to enable the truck 20 and its load to be lowered or raised from or onto an elevated platform, then lengthening the sub-frame 22 by lowering the extension 55 may overcome this problem.

The hand truck 20 is also able to lift a load in a similar manner to a forklift so that the truck can place the load on a stack or lift the load onto an elevated platform without having to resort to lifting the whole truck 20 onto the platform as was described in the previous paragraph. This capability is provided by the sub-frame 22 being able to be retracted from the lower end 54 of the main frame 21 to such an extent that the foot portion 47 is raised above its normal position relative to the main frame 21 as illustrated in figure 12. To lift a load in this manner, the switch 74 is simply operated to retract the sub-frame 22 to such an extent that the foot portion 47 and hence the load are raised to the necessary height. The truck 20 is then pushed forward so that the foot portion 47 and the load are directly above the position where the load is to be deposited. The switch 74 is then operated so that the foot portion 47 and the load are lowered onto the stack or elevated platform. Once the load has been lowered the foot portion 47 can be withdrawn from beneath the load by simply moving the truck 20 away from the load. The reverse of the aforementioned procedure can be used to remove a load from an elevated platform or a stack.

The foregoing describes only one embodiment of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention. For example, the hand truck need not have only two wheels as more wheels or even a single wheel of sufficient width may be used to allow the truck to be wheeled about.

Also, it is conceivable that a mains supply could be used to power the truck's electric motor instead of or in addition to a battery.

Although the preferred embodiment includes a gearbox, it is possible that

the gearbox could be dispensed with in favour of the electric motor directly driving the extending and retracting mechanism.

Moreover, although the preferred embodiment utilises a roller chain as the flexible linkage which couples the motor, main frame and sub-frame together, it is possible that other flexible linkages such as cables or belts could be used instead. If a different type of linkage was used the sprockets of the preferred embodiment would probably have to be replaced with other more suitable components such as pulleys.

The flexible linkage may be configured as an endless linkage with the sub-frame being attached to the linkage at one or more points. Also, the lowermost end of the chain or other flexible linkage which is attached to the sub-frame could instead be attached to the extension so that the extension could be automatically retracted at the same time as the sub-frame is retracted provided that the pins used to secure the extension in position relative to the sub-frame were removed beforehand.

Furthermore, the drive mechanism for extending and retracting the sub-frame which includes the electric motor, gearbox and sprockets could be mounted on the sub-frame rather than the main frame by suitably modifying the frames so that the sub-frame could still be extended and retracted relative to the main frame. The battery could even be mounted on the sub-frame if need be.

Although the frame of the preferred embodiment is telescopic with the sub-frame being slideably received by the main frame, a non-telescopic configuration could be employed instead. Also, either the main frame or the sub-frame may consist of a single frame member rather than a plurality of frame members that are attached to each other as per the preferred embodiment.

The hand truck need not include the extension which forms part of the preferred embodiment.

To further enhance the forklift capability of the invention a pair of tines which are similar to forklift tines could be attached to the foot portion of the truck. Such a modification would enable the hand truck to transport a palletised load.

Also, to increase the stability of the truck when used in its forklift mode and prevent the truck from falling forward, a pair of stabilising arms could be added which extend from the lower end of the main frame in the same direction as the foot

portion. Castors could be attached to the underside of the stabilising arms so that the truck could be wheeled around like a trolley. The stabilising arms could be placed in a stowed position or removed when the truck is not being used in its forklift mode.

Although the preferred embodiment includes purpose-built handles, it should be appreciated that these are not necessary and a user could hold onto the main frame itself for the purposes of tilting or otherwise moving the truck.

The hand truck could include a braking mechanism operable to prevent the sub-frame from inadvertently moving relative to the main frame as a result of the weight of the sub-frame itself or both the weight of the sub-frame and the truck's load being too much for the inertia of the drive mechanism to hold in a particular position relative to the main frame.

Nylon material may be located between the sub-frame and the main frame so as to reduce friction between the sub-frame and the main frame as they move relative to each other.

Other embodiments of the wheel truck may not include cutout switches for preventing the sub-frame from being excessively extended or retracted relative to the main frame.

The hand truck may be provided with wheel brakes which can be selectively engaged by a user to inhibit rotation of the wheels.

DATED this 16th day of January 2004

ANTHONY RENFREW WHITE

By his Patent Attorneys

CULLEN & CO.

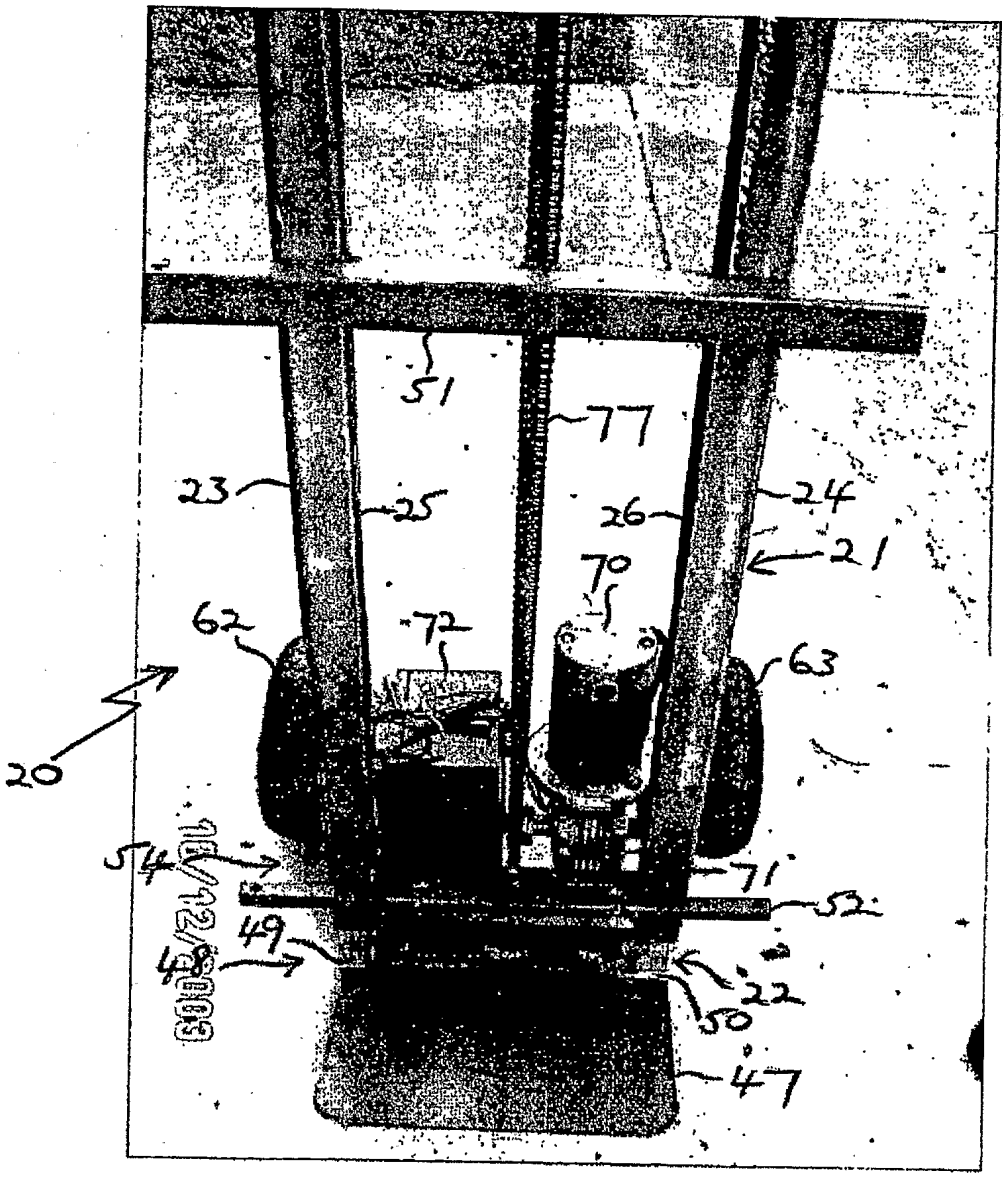

FIGURE 1

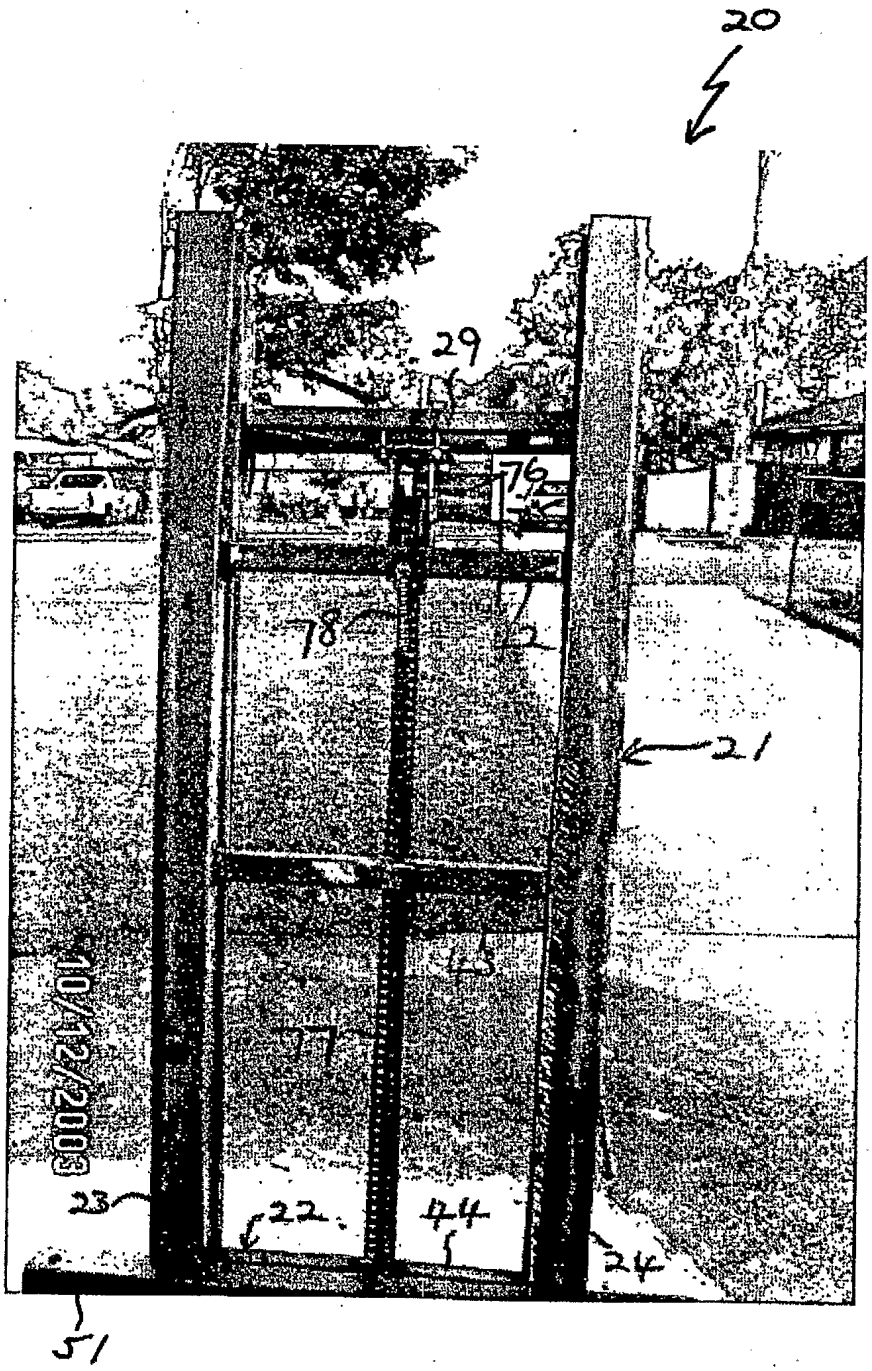

FIGURE 2

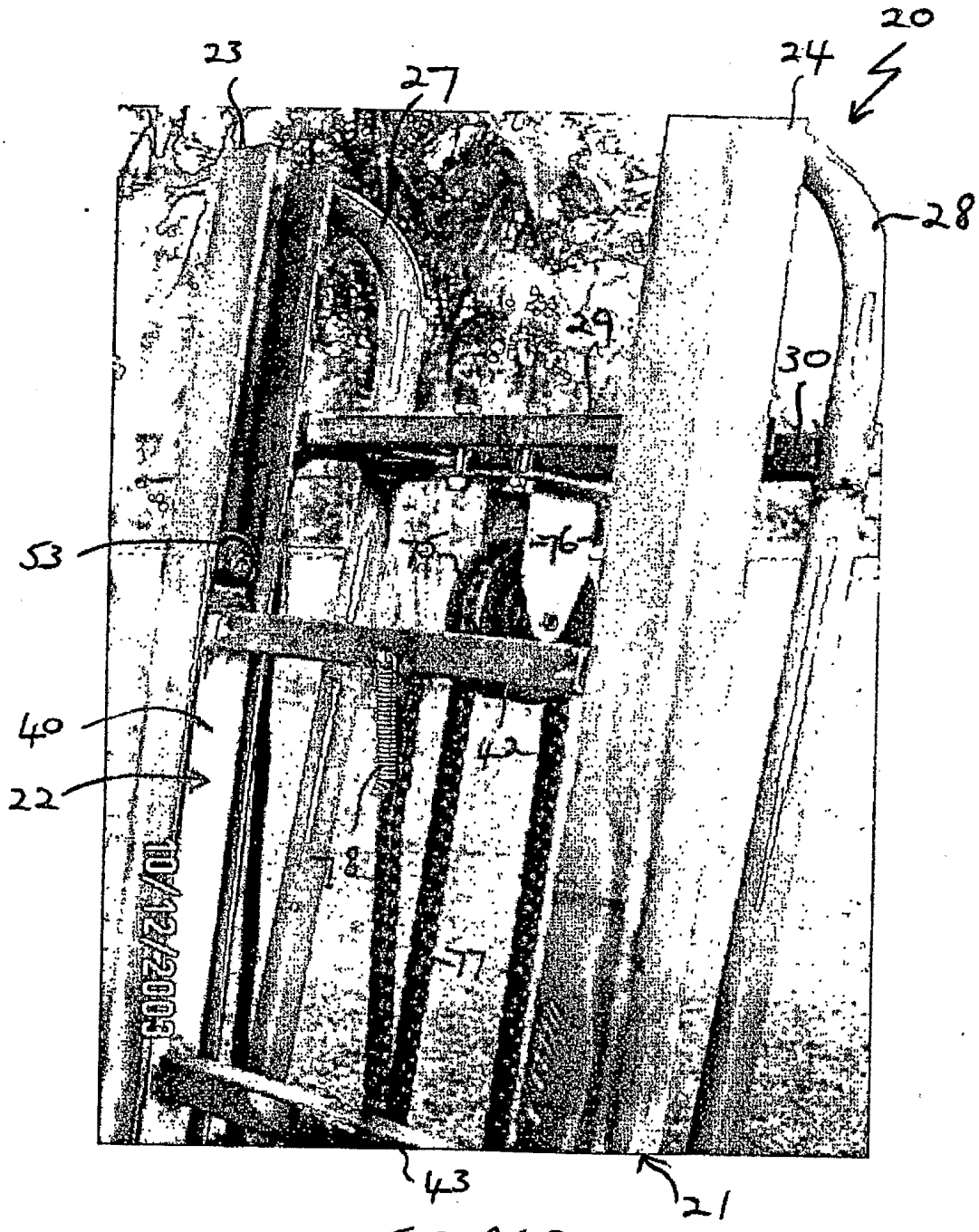

FIGURE 3

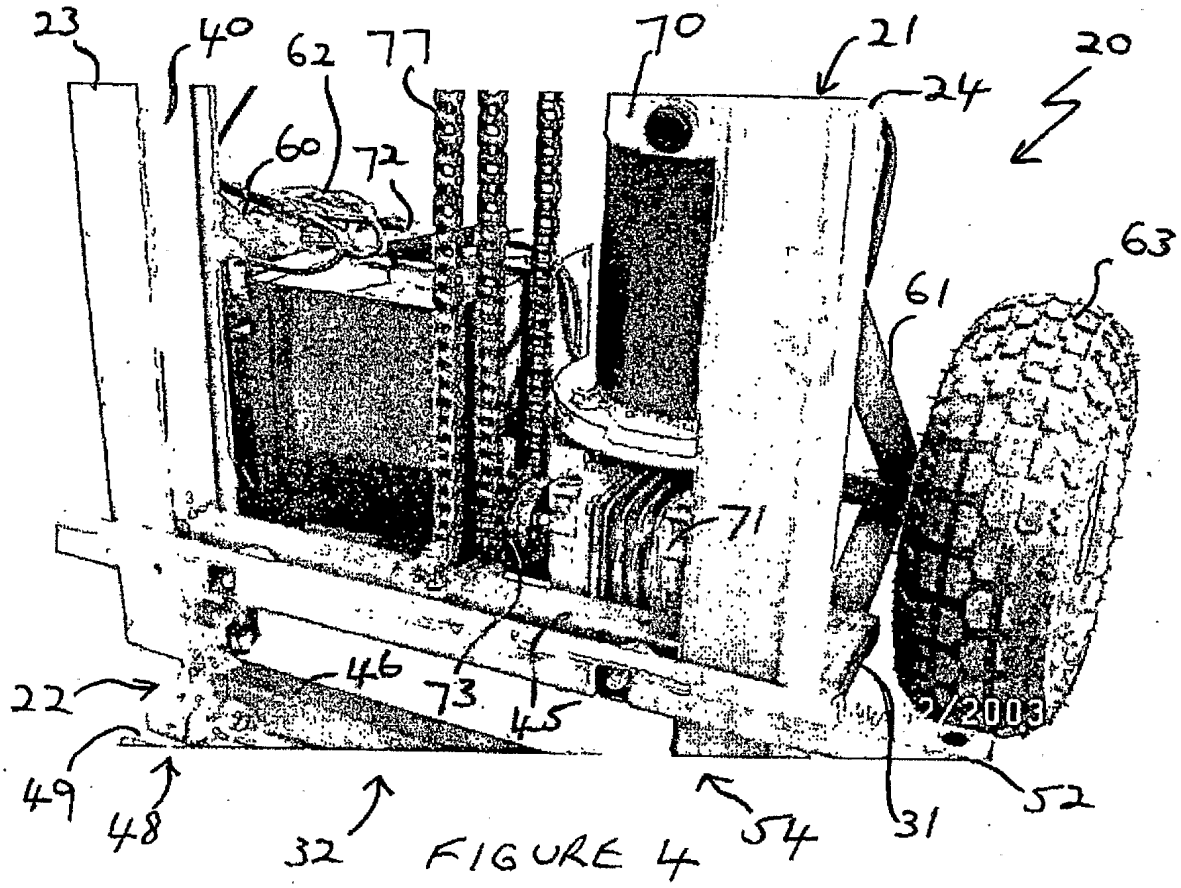

FIGURE 4

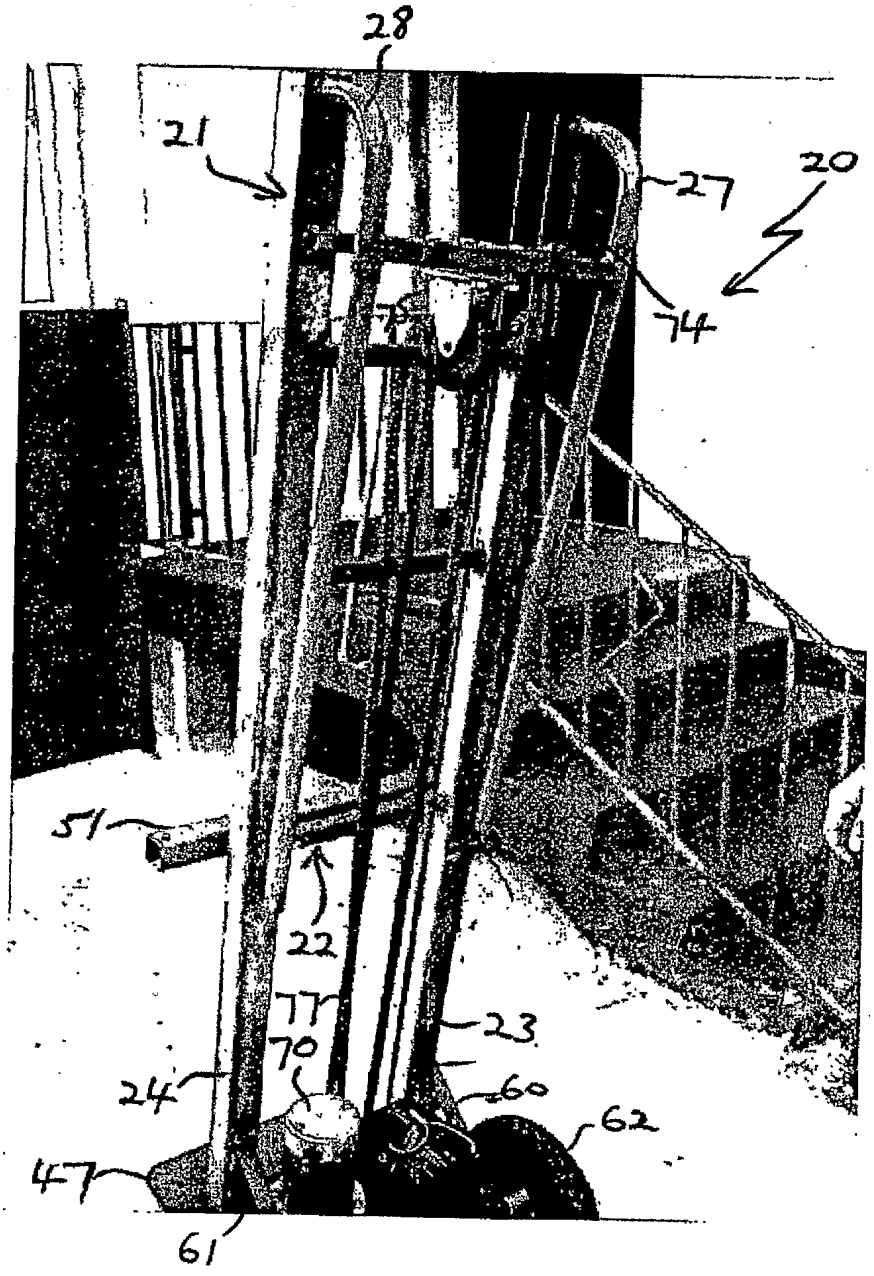

FIGURE 5

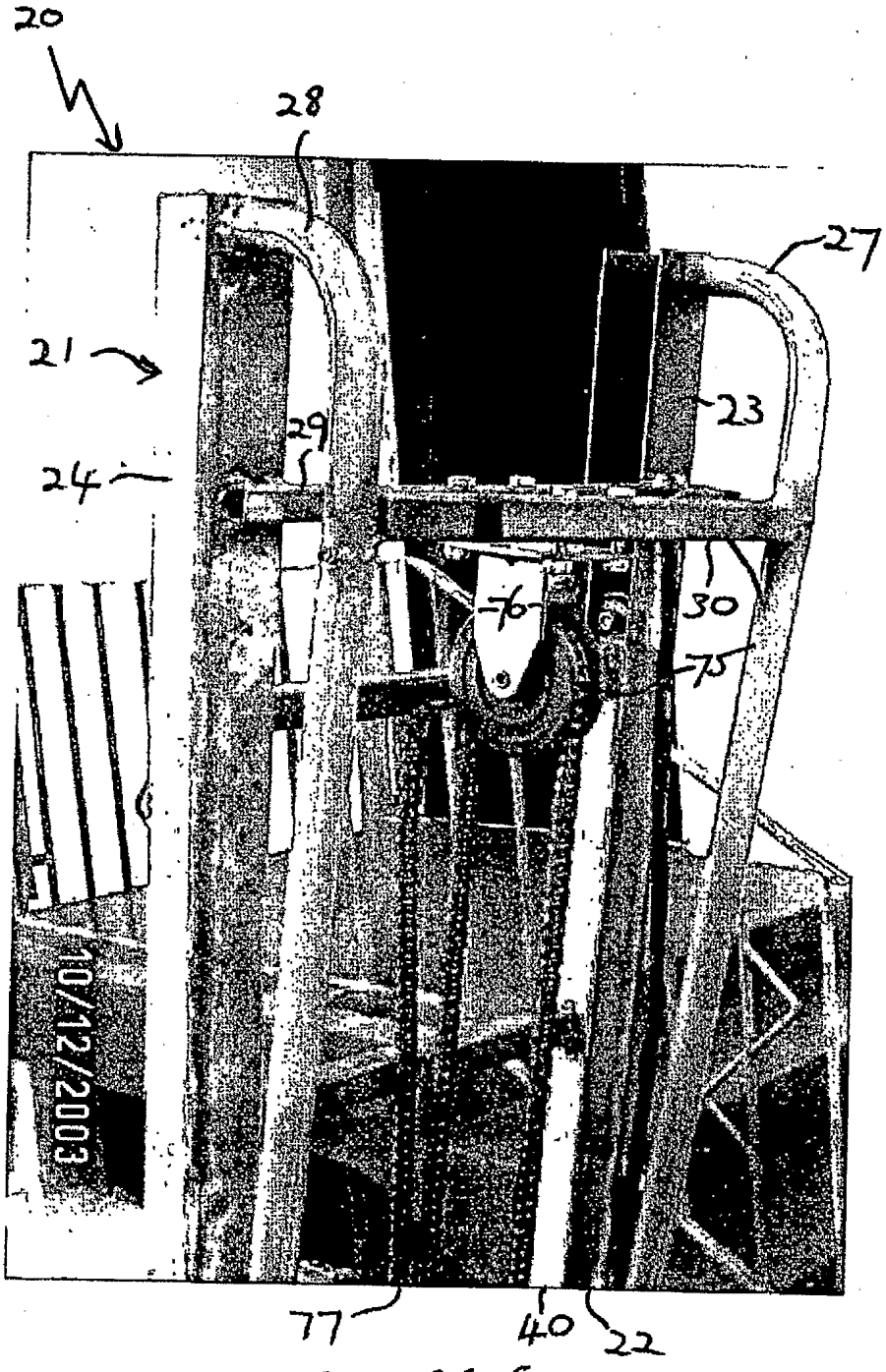

FIGURE 6

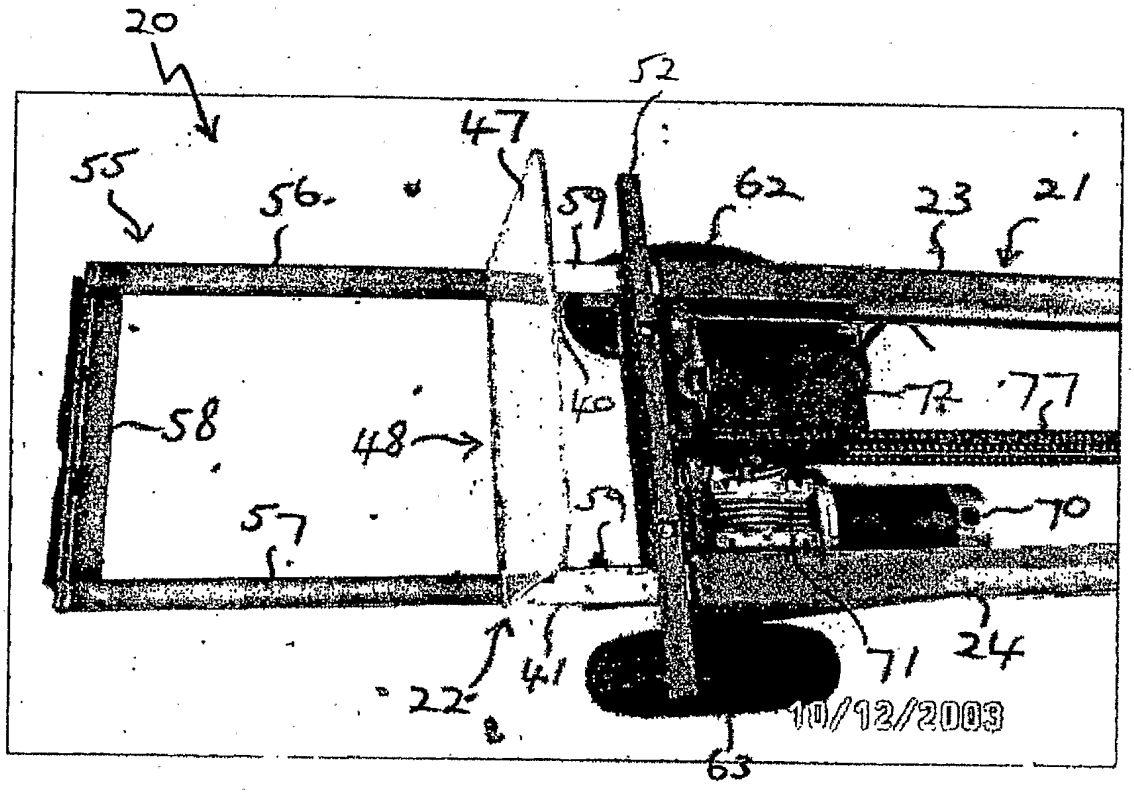
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FIGURE 7

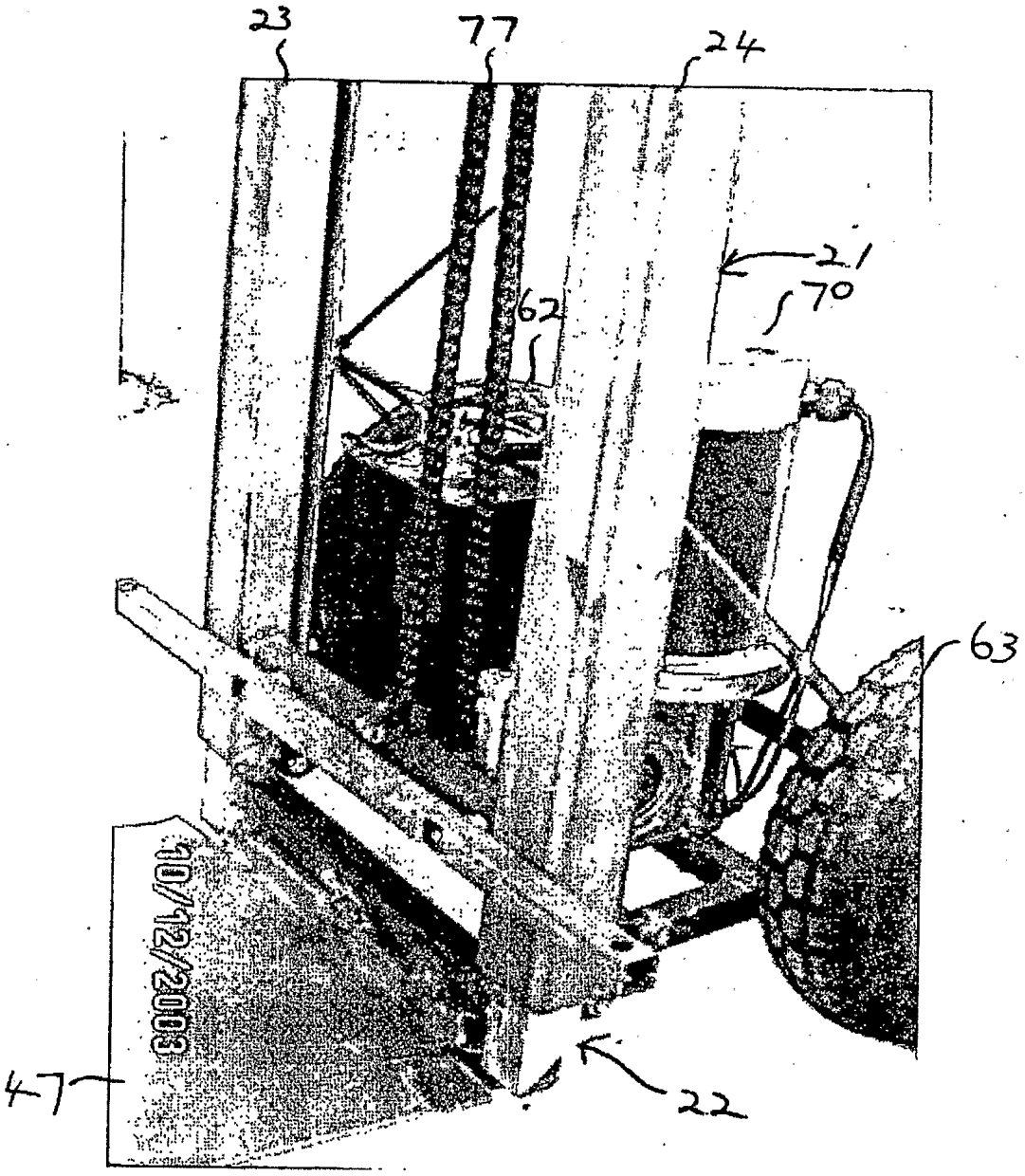

FIGURE 8

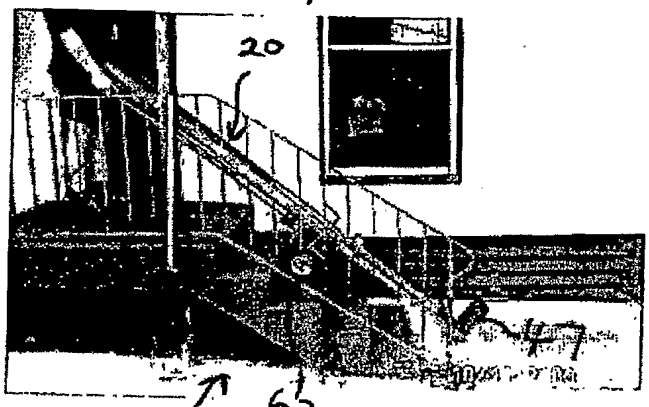

FIGURE 9

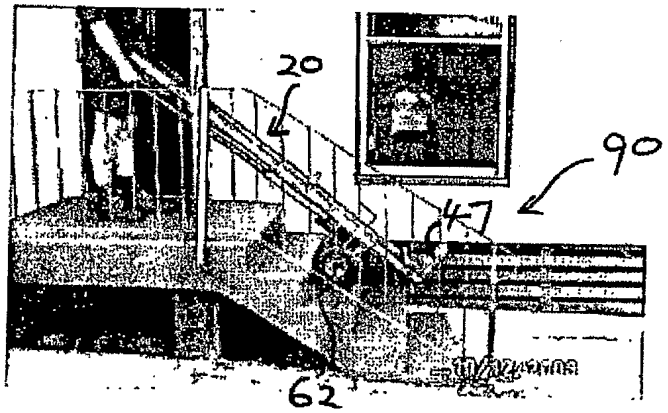

FIGURE 10

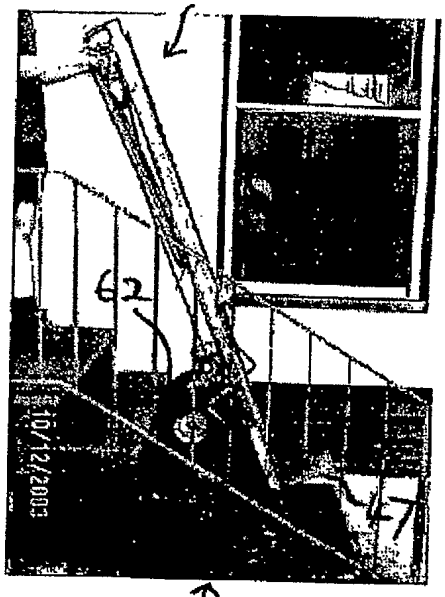

FIGURE 11

FIGURE 12